PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents
United States Patent and Trademark Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 20 June 2000 (20.06.00)	
International application No. PCT/IB99/01748	**Applicant's or agent's file reference** JBJ/P114WO
International filing date (day/month/year) 21 October 1999 (21.10.99)	**Priority date** (day/month/year) 24 October 1998 (24.10.98)
Applicant COLIN, Eric	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

17 May 2000 (17.05.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Pascal Piriou
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
JBJ/P114WO		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/IB99/01748	21/10/1999	24/10/1998
International Patent Classification (IPC) or national classification and IPC		
E05B47/00		
Applicant		
MERITOR LIGHT VEHICLE SYSTEMS - FRANCE et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☒ Certain defects in the international application
   - VIII ☒ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
17/05/2000	28.07.2000
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Vacca, R Telephone No. +49 89 2399 2863

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IB99/01748

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-4 as originally filed

Claims, No.:

1-19 as originally filed

Drawings, sheets:

1/3-3/3 as originally filed

2. The amendments have resulted in the cancellation of:

☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application.

☒ claims Nos. 19.

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 19 are so unclear that no meaningful opinion could be formed (*specify*):

see separate sheet

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for the said claims Nos. .

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-18
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-18
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-18
	No:	Claims	

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

1. Reference is made to the following document:

   D1 = US-A-5 441 317

2. The closest prior art is shown by document D1, disclosing an actuator assembly including a motor (24) having a body portion and a drive shaft (28), the drive shaft being drivably connected to a pinion (26), the pinion drivingly engaging an array of gear teeth of a gear rack (30), the array having a first side adjacent the motor, the gear rack being pivotally mounted via a pivot about a pivot axis.

3. The subject-matter of claim 1 is distinguished therefrom in that said pivot axis is on said first side of the array of gear teeth.
   The requirements of Article 33(2) PCT are therefore met.

   The idea of arranging motor and pivoting gear rack such that said rack pivots about an axis placed on its side adjacent the motor, in order to improve compactness of the assembly, is not taught nor fairly suggested by the prior art presently available.
   The requirements of Article 33(3) PCT are therefore met.

4. The subject-matter of independent claim 17 is distinguished from the assembly disclosed by D1 in that the gear rack is mounted for movement on the body portion of the motor.
   The requirements of Article 33(2) PCT are therefore met.

   The idea of mounting the gear rack on the body of the motor for movement, in order to improve compactness of the assembly, is not taught nor fairly suggested by the prior art presently available.
   The requirements of Article 33(3) PCT are therefore met.

5. Claims 2 to 16 and 18 concern particular embodiments of the invention and include all features of the independent claims they respectively refer to. Therefore, they also meet the requirements of Article 33 PCT.

6. To meet the requirements of Rule 6.3(b) PCT the independent claims 1 and 17

should have been properly cast in the two part form, with those features which in combination are part of the prior art (see D1) being placed in the preamble.

The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

7. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.

8. Claim 19 merely defines the claimed subject-matter by reference to the description and the drawings. According to Rule 6.2(a) PCT, claims should not contain such references except where absolutely necessary, which is not the case here. Accordingly, claim 19 should have been deleted.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
JBJ/P114WO		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/IB 99/01748	21/10/1999	24/10/1998
Applicant		
MERITOR LIGHT VEHICLE SYSTEMS - FRANCE et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   [ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

   [ ] contained in the international application in written form.

   [ ] filed together with the international application in computer readable form.

   [ ] furnished subsequently to this Authority in written form.

   [ ] furnished subsequently to this Authority in computer readble form.

   [ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   [ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

   [ ] the text is approved as submitted by the applicant.

   [X] the text has been established, according to Rul 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. 1

   [X] as suggested by the applicant.

   [ ] None of the figures.

   [ ] because the applicant failed to suggest a figure.

   [ ] because this figure better characterizes the invention.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB 99/01748

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

Insert brackets to all reference numbers.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IB 99/01748

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 E05B47/00 E05B65/36 H02K7/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 E05B H02K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 441 317 A (ITT AUTOMOTIVE ELECTRICAL SYSTEMS INC.) 15 August 1995 see column 1, line 44 - column 2, line 33; figures	1,9,10, 17,18
A	US 5 584 515 A (KELSEY-HAYES COMPANY) 17 December 1996 see column 3, line 9 - column 22, line 43; figures	1,4, 9-11,17, 18
A	US 4 573 723 A (NIPPONDENSO CO., LTD.) 4 March 1986 see figures	1,9-13, 15,17,18
A	WO 90 05822 A (CAPITAL MARKETING LIMITED) 31 May 1990 see figures	1,9,17, 18

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 March 2000	22/03/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Vacca, R

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Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IB 99/01748

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 617 812 A (SECURITY & AUTO ELECTRICAL DESIGNS LTD.) 21 October 1986 see figures	1,9,17, 18

1

INTERNATIONAL SEARCH REPORT

[redacted]nation on patent family members

[redacted]rnational Application No
PCT/IB 99/01748

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5441317 A	15-08-1995	DE 69413037 D	08-10-1998
		EP 0704015 A	03-04-1996
		ES 2125464 T	01-03-1999
		WO 9429554 A	22-12-1994
US 5584515 A	17-12-1996	NONE	
US 4573723 A	04-03-1986	JP 1633424 C	20-01-1992
		JP 2061670 B	20-12-1990
		JP 60113856 A	20-06-1985
WO 9005822 A	31-05-1990	AU 4659689 A	12-06-1990
		CA 2003477 A	21-05-1990
US 4617812 A	21-10-1986	CA 1254397 A	23-05-1989
		EP 0142319 A	22-05-1985
		JP 60238584 A	27-11-1985

AN ACTUATOR ASSEMBLY

The present invention relates to actuator assemblies and in particular electrical actuators used to actuate components, for example door locks, door latches or door deadlocks in vehicles.

It is an object of the present invention to provide a compact actuator assembly. It is a further object to provide an actuator assembly that is easy to install. It is a further object to provide an actuator assembly that has relatively few components and is relatively cheap to produce.

Thus according to the present invention there is provided an actuator assembly including a motor having a body portion and a drive shaft, the drive shaft being drivably connected to a pinion, the pinion drivingly engaging an array of gear teeth of a gear rack the array of gear teeth having a first side adjacent the motor, in which the gear rack is pivotally mounted via a pivot about a pivot axis on said first side of the array of gear teeth.

Preferably the pivot axis passes through the body and/or is proximate that end of the motor remote from the pinion.

Preferably the gear rack includes at least one stop to limit movement of the rack relative to the body portion and preferably the drive shaft passes

between the array of gear teeth and a guide portion proximate the gear teeth.

Preferably each stop supports the guide portion.

According to a further aspect of the invention there is provided an actuator assembly including a motor having a body portion and a drive shaft, the drive shaft being drivably connected to a pinion, the pinion drivingly engaging an array of gear teeth of a gear rack with the gear rack being mounted for movement on the body portion.

Preferably the motor is an electric motor.

The invention will now be described by way of example only with reference to the drawings in which;-

Figures 1,2 and 3 are different isometric views of an actuator assembly according to the present invention.

With reference to figures 1-3 there is shown an actuator assembly 10 which includes a motor 12 (in this case an electric motor). The motor includes a body portion 14 and a drive shaft 16. The drive shaft is drivably connected to a pinion 18. The pinion 18 drivingly engages an array of gear teeth 20 fixed to a gear rack 22.

The gear rack is of generally octant shape with the array of gear teeth 20 being arranged in an arcuate manner. The array of gear teeth have a first side 21 adjacent the motor. The gear rack includes a boss 24 which fits into a hole (not shown) of a housing (not shown) to provide a pivot. Gear rack 22 thus can rotate about axis 25A of boss 24. It should be noted that axis 25A

passes through body portion 14.

The housing substantially surrounds the motor and gear rack and can be substantially sealed against the ingress of contaminants eg. dirt, dust, or water. The motor is secured in the housing, preferably by engagement of each end of the drive shaft with the housing.

Preferably the housing is of at least two part form, a first part having two cut-outs each cut-out accepting and supporting one end of the drive shaft, the second part having complementary cut-outs which in conjunction with the cut-outs of the first part provide a journal bearing for each end of the drive shaft 16. The second part also has a hole to accept and provide a journal for boss 24.

In use the boss is connected to a lever situated on the outside of the housing, the lever being connected to the component to be actuated.

Extending beyond the gear teeth 20 there are two stops 26 and 28 which limit movement of the gear rack relative to the body portion 14 by engagement with the drive shaft 16. Figure 1 shows the gear rack 22 at an extreme position wherein stop 28 has engaged drive shaft 16. Figure 1 also shows (in chain dotted line) the other extreme of movement of the gear rack relative to the body portion wherein stop 26 has engaged drive shaft 16.

Guide portion 30 connects stops 26 and 28, resulting in a stronger arrangement. Guide portion 30 is mounted on the opposite side of shaft 16 to the array of gear teeth 20. Guide portion 30 includes a guide surface 32 along which the drive shaft 16 passes in close proximity or alternatively in light engagement therewith. When the motor 12 is producing torque the

engagement of the pinion with appropriate gear teeth of the array causes a separating force which preferably can be counteracted by the guide surface 32 acting upon the drive shaft 16, thus reducing the load as seen by the pivot 25.

In use operation of the motor in a first rotational direction causes the pinion to move the gear rack to a first position and operation of the motor in a second rotational direction causes the pinion to move the gear rack to a second position.

In further embodiments the gear rack can be of an alternative segment shape such as a quadrant or a sextant and in yet further embodiments the gear rack need not be of a segment shape.

The invention provides for a particularly compact arrangement since a substantial part of the gear rack can be arranged to lie alongside the motor. Furthermore the actuator assembly is axially compact, it being noted that no part of the gear rack projects beyond that end of the drive shaft having the pinion secured thereto. It should also be noted that the actuator shown in the figures only has two moving parts namely the drive shaft/pinion and the gear rack.

CLAIMS

1. An actuator assembly including a motor having a body portion and a drive shaft, the drive shaft being drivably connected to a pinion, the pinion drivingly engaging an array of gear teeth of a gear rack the array of gear teeth having a first side adjacent the motor, in which the gear rack is pivotally mounted via a pivot about a pivot axis on said first side of the array of gear teeth.

2. An actuator assembly as defined in Claim 1 in which the pivot axis passes through the body portion.

3. An actuator assembly as defined in Claim 1 or 2 in which the pivot axis is proximate that end of the motor remote from the pinion.

4. An actuator assembly as defined in any preceding claim in which the gear rack includes at least one stop to limit movement of the rack relative to the body portion.

5. An actuator assembly as defined in Claim 4 in which the or each stop engages the drive shaft.

6. An actuator assembly as defined in Claim 5 in which the or each stop engages a portion of the drive shaft on the side of the pinion remote from the motor.

7. An actuator assembly as defined in any preceding claim in which the drive shaft passes between the array of gear teeth and a guide portion proximate the gear teeth.

8. An actuator assembly as defined in Claim 7 when dependent on any one of Claim 4-6 in which the guide portion is supported by the or each stop.

9. An actuator assembly as defined in any preceding claim which further includes a housing in which the motor is secured.

10. An actuator assembly as defined in Claim 9 in which the pivot is mounted on the housing.

11. An actuator assembly as defined in Claim 9 or 10 in which the pivot includes a boss of the gear rack to which in use a lever is attached.

12. An actuator assembly as defined in Claim 11 in which the boss at least partially projects through the housing.

13. An actuator assembly as defined in any one of Claims 9-12 in which the drive shaft engages the housing.

14. An actuator assembly as defined in any one of Claims 9-13 in which the housing is substantially sealed.

15. An actuator assembly as defined in any one of Claims 9-14 in which the housing has at least a first and second part, the parts having co-operating cut-outs to provide for at least one end of the drive shaft.

16. An actuator assembly as defined in any one of Claims 1-9 or 11-15 when dependent upon Claim 9 in which the pivot is mounted on the body portion.

17. An actuator assembly including a motor having a body portion and a drive shaft, the drive shaft being drivably connected to a pinion, the pinion drivingly engaging an array of gear teeth of a gear rack with the gear rack being mounted for movement on the body portion.

18. An actuator assembly as defined in any preceding claim in which the motor is an electric motor.

19. An actuator assembly as herein before described with reference to or as shown in figures 1-3 of the accompanying drawings.

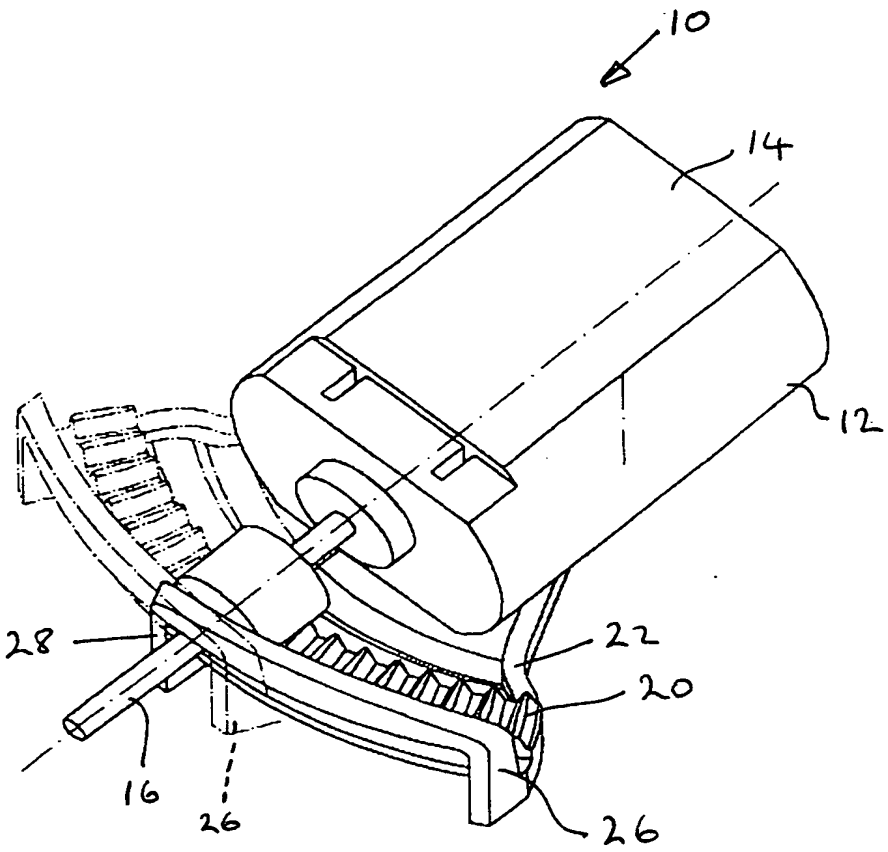

FIG1

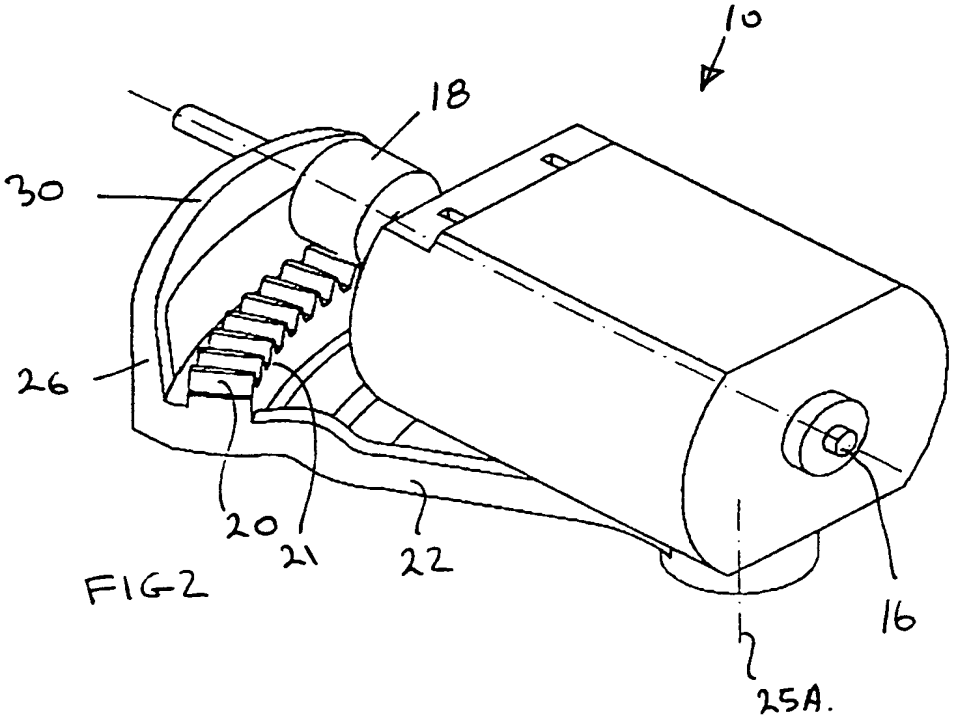

FIG2

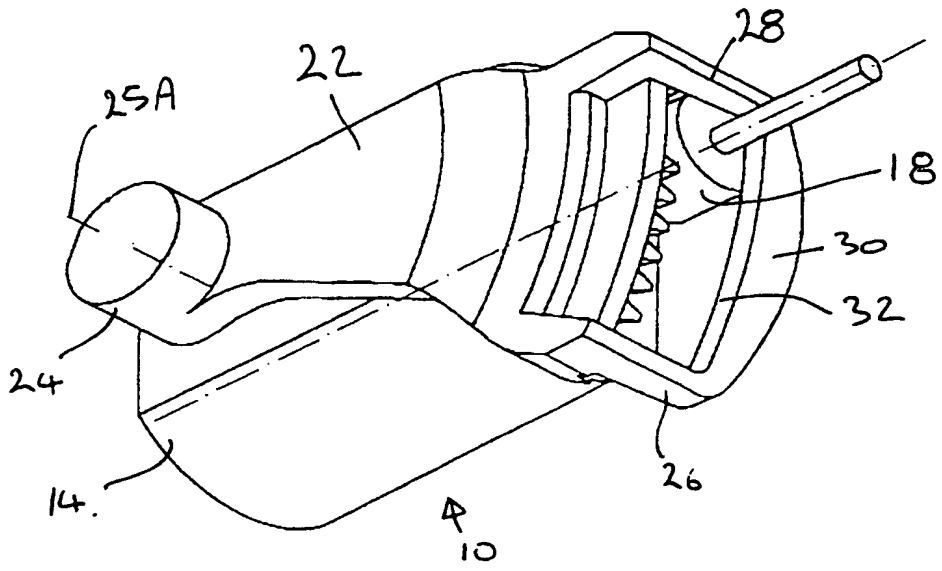

FIG3